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Fiction reading experience predicts narrative production skills in 9- to 12-year-old children

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BACKGROUND

Producing fictional narratives draws on a host of advanced linguistic, cognitive and social cognitive skills (Hudson & Shapiro, 1991). Previous research indicates that by the age of 9 years, nearly all typically developing children can provide an adult-like global structure for narratives (Berman & Slobin, 1994); however, substantial individual differences remain in the linguistic complexity, cohesion, and evaluative devices (e.g., references to characters' mental states) utilised in narrative production (Bamberg & Damrad-Frye, 1991; Norbury & Bishop, 2003). Narrative competence has been linked to the development of oral language (Manhardt & Rescorla, 2002), mentalising skills (Accorti Gamannossi & Pinto, 2014; Riggio & Cassidy, 2009) and reading comprehension (Cain, 2003).

Recreational reading (i.e., reading outside the school curriculum or work) has been associated with a range of positive developmental outcomes, most notably gains in vocabulary (Sullivan & Brown, 2015). The direction of causation has been suggested to be reciprocal, such that children with more advanced verbal skills are more likely to read for pleasure, which in turn facilitates the growth of language skills (Mol & Bus, 2011). However, a recent study using data from a large sample of 7-year-old twins tested a number of explanatory models for the correlation between print exposure and reading competence, finding that reading skills predicted print exposure but not vice versa (Van Bergen et al., 2018). Thus recreational reading should not be viewed as a pure measure of "environment", but is likely to reflect underlying gene-environment correlation mechanisms (Puglisi, Hulme, Hamilton, & Snowling, 2017).

In addition to links with language and reading skills, recreational reading (and particularly engagement with fiction) has been associated with mentalising skills (e.g., the ability to infer others' thoughts, beliefs, desires and emotions; Boerma, Mol, & Jolles, 2017; Mar, Tackett, & Moore, 2010). Oatley (2016) argues that fiction provides a unique simulation of the complex social world, allowing readers to practise mentalising skills as they interpret and predict the behaviours of characters. Experience of inferring mental states of fictional characters while reading may also facilitate children's sophisticated narrative skills (e.g., the use of mental state terms).



OBJECTIVES

The current study aimed to examine the relationship between 9- to 12-year-old children's experience of reading fiction and a range of narrative production skills, using concurrent data from Phase 1 of an ongoing longitudinal study. The study addressed two key research questions:

- How can individual differences in narrative production skills during middle childhood best be characterised?
 - It is possible that linguistic, discourse, and social cognitive aspects of narrative production cluster together as a single factor, or these skills may be dissociable.
- Do children who have more experience of fiction reading show more sophisticated narrative skills?
 - If fiction reading experience predicts narrative production, is this effect explained by individual differences in vocabulary, word reading, and mentalising?

MATERIALS AND METHODS

125 children (49% males; mean age 10;6 (s.d. 12.43 months)) completed a battery of tests assessing aspects of language, reading, and mentalising ability.

Fiction Reading Experience

Author recognition test: list of authors of children's fiction intermixed with foils. Children check the names of authors that they recognise; marks deducted for foils checked.

Book recognition test: children presented with a series of key illustrations from classic and recent bestseller children's fiction books. Two points awarded for each book title named; 1 point for other information about the book (e.g., details of story).

Reading habits questionnaire – four self-report items relating to fiction reading (e.g. "How often do you read fiction books?")



Principal components analysis indicated that the measures of fiction reading experience loaded onto a single factor explaining 59% of the variance in the data (eigenvalue = 2.36; KMO = .75; Bartlett's $\chi^2 = 125.45$, $p < .001$).

Controlled variables

- Receptive Vocabulary (British Picture Vocabulary Scale III; Dunn, Dunn, & Lloyd, 2009)
- Mentalising (Strange Stories short-form; Happé, 1994)
- Word Reading (Single Word Reading Test; Hulme et al., 2010)

Narrative Production Skills

Children's narratives were elicited from a wordless picture book (Frog, where are you? Mayer, 1969). Narratives were audio-recorded and all on-task utterances Were coded for eight variables tapping different aspects of narrative skill.



Table 1: Narrative production coding scheme

Construct	Measure	Cohen's kappa
Productivity	Number of words produced	n/a
Linguistic complexity	Proportion of complex (multi-clause) sentences	.81
Linguistic complexity	Mean length of utterance (morphemes)	.97
Semantic detail	Number of propositions recounted, of all indicated by illustrations (Norbury & Bishop, 2003)	.80
Linguistic cohesion	Number of causal, temporal or adversative inter-clausal connectives per proposition	.77
Narrative coherence	Score on bespoke scale (inclusion of initiating event, references to overarching theme, resolution)	.78
Mental-state language use	Number of cognitive, emotional, desire/ belief terms per C-unit	.73
False belief narration	Sophistication of narration of 'deer scene' (Berman & Slobin, 1994)	.87

The eight narrative production variables were subjected to Principal Components Analysis, using maximum likelihood extraction with direct oblimin rotation (since all were derived from a single narration episode, and therefore factors were expected to be inter-related) in order to examine the underlying factor structure of the coded variables.

RESULTS

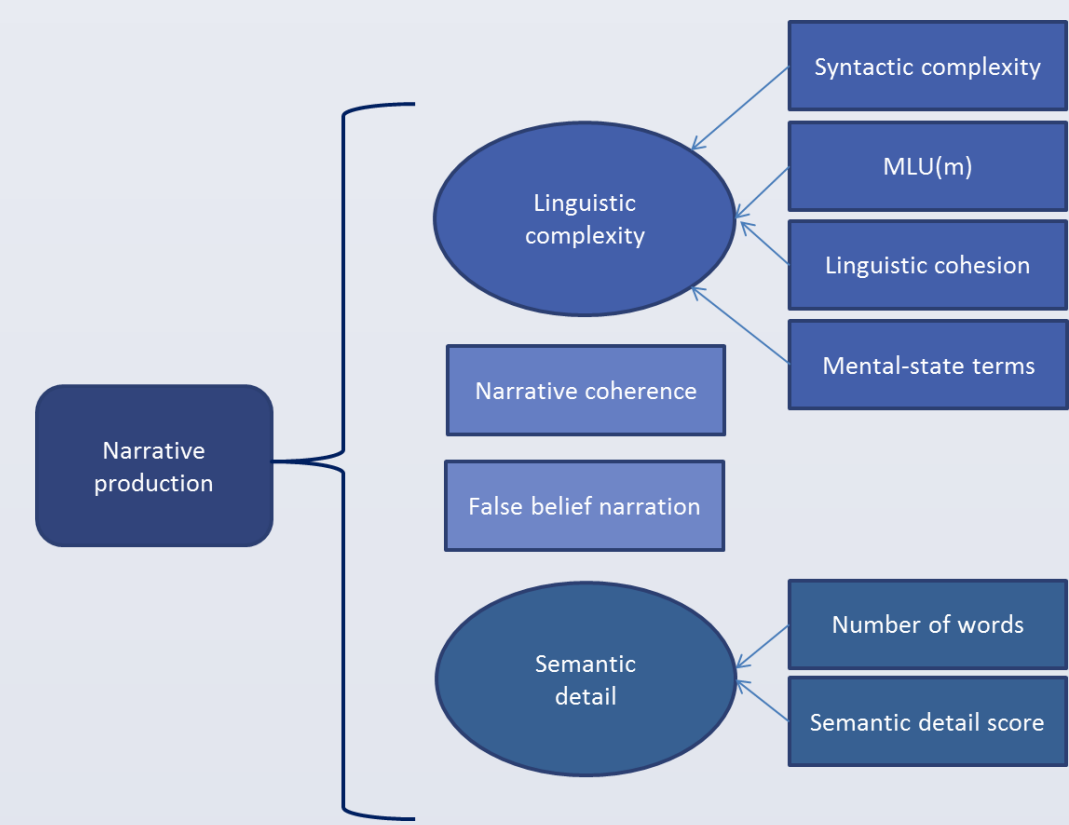
Characterising Children's Narratives

Table 2: Raw correlations (above diagonal) and partial correlations, controlling for child age (below diagonal) between eight narrative production variables

	1. MLU(m)	2. Syntactic complexity	3. Cohesion	4. Mental-state terms	5. Number of words	6. Semantic detail	7. Coherence	8. False belief narration
1. MLU(m)		.85***	.58***	.59***	.50***	.56***	.09	.25**
2. Syntactic complexity	.84***		.61***	.58***	.30**	.39***	.16	.16
3. Cohesion	.57***	.60***		.48***	.35***	.33***	.23**	.27**
4. Mental-state terms	.59***	.58***	.48***		.47***	.34***	.15	.13
5. Number of words	.51***	.29**	.34***	.47***		.77***	.27**	.28**
6. Semantic detail	.53***	.35***	.30**	.32***	.77***		.25**	.36***
7. Coherence	.09	.16	.23**	.15	.00	.26**		.02
8. False belief narration	.01	.14	.26**	.13	.00	.36***	.02	

** $p < .01$; *** $p < .001$

Figure 1: Factor structure of narrative production variables



PCA indicated two narrative production factors explaining 77.53% of the variance in the data (KMO = .73; Bartlett's $\chi^2 = 449.41$, $p < .001$); narrative coherence and false belief narration showed low factor loadings on both factors and were therefore analysed separately.

Predicting Individual Differences in Narrative Production

The fiction reading experience factor showed weak to moderate positive correlations with receptive vocabulary ($r = .46$, $p < .001$); mentalising ($r = .27$, $p < .01$) and word reading ($r = .47$, $p < .001$), and with three aspects of narrative production (linguistic complexity, semantic detail, and false belief narration, $r = .24$ -.33, $p < .01$) but not narrative coherence.

Figure 2: Scatterplots showing correlations between fiction reading experience factor and four narrative variables

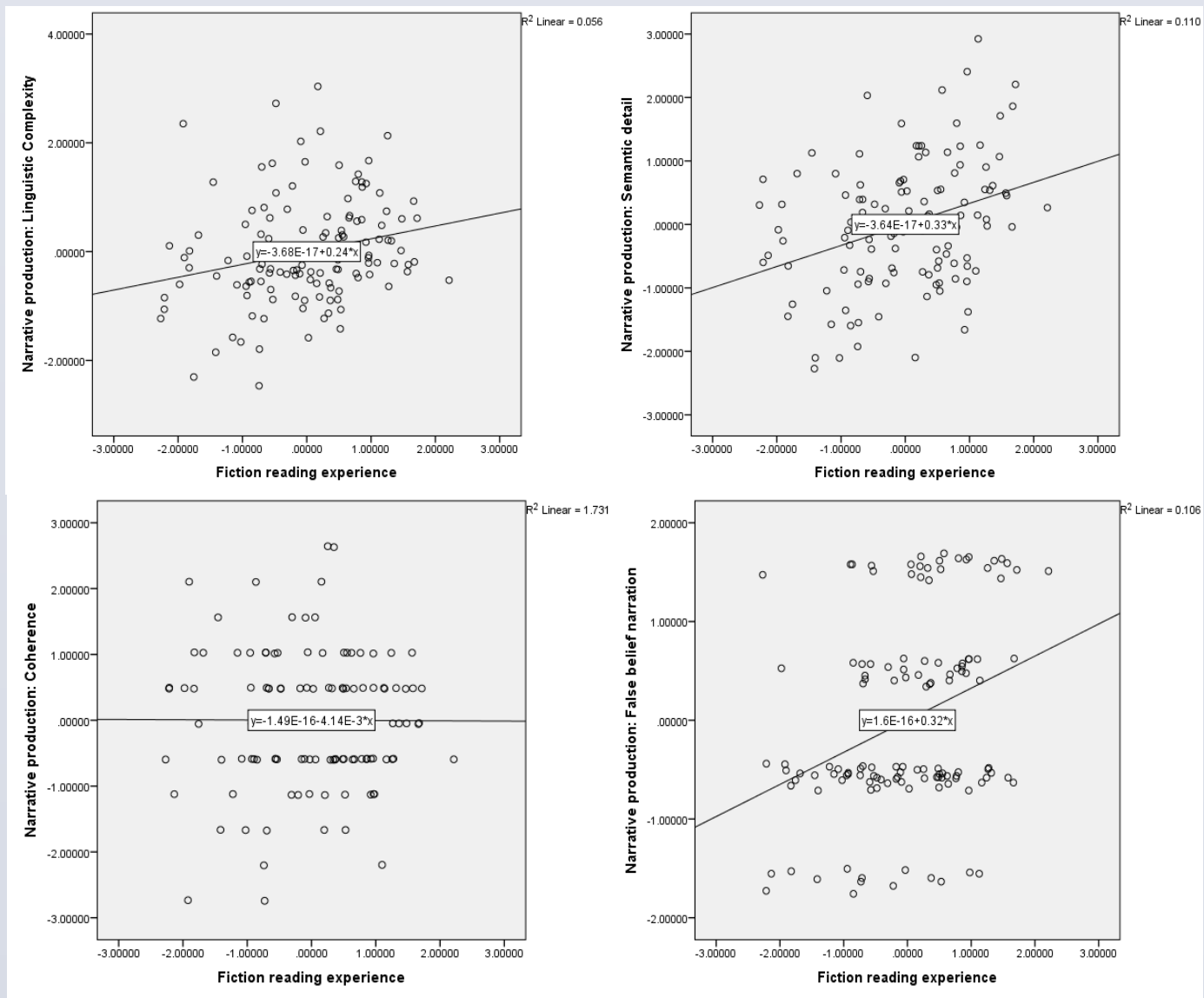


Table 3: Hierarchical regression predicting semantic detail in children's narratives

Predictor	B (SE)	B	T	ΔR^2
Step 1				
Vocabulary	.02 (.01)	.21	1.86	.13
Word reading	.00 (.01)	.03	.27	
Mentalising	.06 (.09)	.06	.61	
Step 2				
Fiction reading exp	.21 (.10)	.21	2.08*	.03

* $p < .05$

An ordinal regression model predicting false belief episode narration using fiction reading experience and the three covariates was a significant improvement on the intercept only model ($\chi^2(4) = 16.71$, $p = .002$; Pearson $\chi^2(365) = 381.18$, $p = .269$; Nagelkerke $R^2 = .14$). Fiction reading experience was the only significant predictor of false belief narration scores.

After controlling for receptive vocabulary, word reading and mentalising, fiction reading experience predicted a small amount (3%) of unique variance in semantic detail within children's narratives ($F(3, 120) = 5.52$, $p < .001$; $R^2 = .16$).

Table 4: Ordinal regression predicting children's false belief episode narration

Predictor	Log odds est. (SE)	Wald	95% CIs
Vocabulary	.02 (.02)	.70	-.02 -.05
Word reading	.01 (.02)	.10	-.04 -.05
Mentalising	.07 (.18)	.13	-.29 -.42
Fiction reading exp	.56 (.21)	7.32**	.15 -.96

* $p < .01$

CONCLUSIONS

Analysis of 125 narratives produced by 9- to 12-year-old children yielded two latent factors, relating to the levels of linguistic complexity and semantic detail present in the narratives respectively. Measures of narrative coherence and false belief narration did not clearly load onto either of these factors. Children's experience of fiction reading was a significant predictor of unique variance in two dimensions of narrative skill (level of semantic detail and false belief narration).

These findings suggest that children who read more fiction are able to produce more sophisticated narratives when elicited from a wordless picture book. Specifically, fiction reading experience is associated with the ability to infer narrative detail from illustrations, including information about characters' false beliefs, a common plot device. The fact that fiction reading experience continued to predict a small amount of unique variance in these aspects of narrative production after the control variables were entered into the regression models indicates that the association is not explained by vocabulary, reading or mentalising skills. It is possible therefore that reading fiction plays a causal role in the development of sophisticated narrative production, by allowing children the opportunity to become familiar with story conventions (as well as complex vocabulary and grammatical structures; e.g., Montag & McDonald, 2015). However, longitudinal data are required to test this hypothesis.

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